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A paper by Prof. L. H. Pammel, "Notes on some Plants of Iowa," was read by title.

Prof. Coulter discussed the use of the terms close-fertilization and cross-fertilization.

A paper by Mr. R. S. Williams, "A List of the Mosses of northern Montana," was read by title. Mrs. Britton stated that sets of these mosses were in preparation.

Prof. Kellerman described a method of card-indexing a state flora, using for each species a card on which was printed a map of the state showing counties. He had used this in Kansas and in Ohio. Prof. Tracy said he had successfully applied it to Mississippi.

New and noteworthy Species of *Saxifraga*.

BY JOHN K. SMALL.

SAXIFRAGA OCCIDENTALIS S. Wats. Proc. Am. Acad. 23: 264. 1888.

This species was founded on plants collected on Vancouver Island, by Prof. Macoun. It is a beautiful and distinct species averaging one decimeter in height, with a purple hue which extends even to the petals and filaments; it also possesses an abundance of red or reddish tomentum on the lower surface of the finely crenate leaves. This form is not as widely distributed as indicated by Dr. Watson, when he states "the specific name is given to the species as the western correlative of the common eastern *S. Virginiensis*," nor is it the western correlative of the latter species, *Saxifraga Californica*, proposed in the following year holding that place. *Saxifraga occidentalis* is apparently confined to Vancouver Island and the mainland in the immediate vicinity.

SAXIFRAGA VIRGINIENSIS Michx. Fl. Bor. Am. 1: 269. 1803.

Represents one of the most variable and perplexing species of the genus *Saxifraga*, but notwithstanding its variability in habit, size and flowers, there are two characters which serve to separate it from its relatives in western North America, namely, the triangular triangular-ovate or rarely almost lanceolate acute or acutish calyx-segments, and the narrowly elliptic or elliptic-spatulate obtuse or acute (rarely if ever notched) petals.

While collecting in the cañon below the Falls of the Yadkin river in North Carolina last April, I found unusually well developed plants of *Saxifraga Virginiensis* ranging from four to five decimeters in height, but more remarkable was the great quantity of small bulblets produced by the subterranean portions of the plants, and also the numerous offsets. The same features were noticed in specimens gathered on Dunn's mountain in the same state.

SAXIFRAGA CALIFORNICA Greene, Pittonia, 1: 286. 1889.

In the light of recent discoveries, Prof. Greene has not pointed out any reliable distinguishing characters in discussing the relations between *Saxifraga Californica* and *S. Virginiensis*. The two species are closely related in habit, and the one is about as variable as the other. Prof. Greene lays much stress on the occurrence of small bulblets in *Saxifraga Californica*, but we now know that *S. Virginiensis* also possesses this character. After examining many specimens for the purpose of finding some diagnostic characters in the two closely related plants, I find that the flower furnishes the best. Besides the reflexed or erect calyx-segments, these organs in *Saxifraga Californica* are ovate or oblong-ovate and obtuse, while those of *S. Virginiensis* are triangular, triangular-ovate, or rarely nearly lanceolate, and acute or acutish. The petals furnish another character; those of the western plant are broadly oval or suborbicular, some or all notched at the apex, while their lateral nerves vanish in the blade; in the eastern plant they are narrowly elliptic or elliptic-spatulate, not notched at the apex, and the lateral nerves converge to the mid-nerve at the apex.

SAXIFRAGA FRAGOSA Suksdorf n. sp.

Perennial by an ascending or horizontal rootstock, scapose slender, pale-green, rough glandular-pilose with rigid hairs. Leaves basal, leathery, the blades ovate or oblong-ovate, 1.5–4 cm. long, usually exceeding the petioles, glabrate, obtuse, entire or undulately toothed, abruptly narrowed or truncate at the base, decurrent on the winged petiole, which is slightly dilated at the base; scapes erect or assurgent, 2–3 dm. tall, solitary, paniculately or somewhat corymbosely branched at the top, the branches ascending or nearly erect, subtended by lanceolate or spatulate bracts; flowers white, 5–6 mm. broad, in many-flowered cymules; calyx broadly campanulate, the tube 2.5 mm. broad, adnate to the

ovary, the segments triangular or triangular-ovate, obtuse, 3-nerved, longer than the tube; petals obovate, obtuse or notched at the apex, 2.5 mm. long, strongly 3-nerved, the lateral nerves arising below the middle and converging toward the apex; filaments subulate, shorter than the petals; carpels of the ovary flat and surrounded by a disk; follicles globose-ovoid, 3.5 mm. long, distinct, tipped by short diverging styles; seeds obovoid, more or less pointed at both ends.

Wet rocks near the Columbia river, W. Klickitat County, Washington. Collected by W. N. Suksdorf. (no. 1727.)

The specimens on which this species is founded were collected in March and May, 1892, and distributed later with the manuscript name which I have taken up. It was collected also in Oregon, by Mr. Thomas Howell in May, 1895, "on wet slopes, Gladstone" (no. 192).

The species is related to *Saxifraga Californica*, but differs in its more rigid habit, rough and stiff pubescence, the narrow thyrsoid panicle or corymb and the triangular or triangular-ovate calyx-segments.

SAXIFRAGA TENNESSEENSIS n. sp.

Saxifraga Grayana Kearney, Bull. Torr. Club, 21: 262. 1894. Not Britton, 1894.

Perennial by a short erect or ascending rootstock, scapose, glandular-pilose, bright green. Leaves basal, ovate or sometimes suborbicular, the blade 2-6 cm. long, obtuse or rounded at the apex, but usually terminated by a tooth, coarsely crenate-dentate, abruptly narrowed at the base, the petiole winged, longer or shorter than the blade; scapes erect or assurgent, 1-2.5 dm. tall; branches of the panicle subtended by linear or spatulate bracts; cymules open; flowers white, 8-9 mm. broad; calyx flattish, 5 mm. broad, its tube adherent to the ovary, its segments triangular-ovate, 1-1.5 mm. long, acute, spreading, longer than the tube; petals lanceolate, 3.5-4 mm. long, obtuse or slightly notched at the apex, sessile or nearly so, with two lateral nerves which arise below the middle and converge at the apex, the lateral nerves often giving off short secondary branches; filaments subulate, somewhat longer than the calyx-segments, mature fruit not seen.

Rocky bluffs of the Tennessee River about Knoxville. Altitude about 270 meters.

Saxifraga Tennesseeensis was apparently first collected by Prof. A. Ruth, of Knoxville, Tennessee, but first brought to notice by

Mr. T. H. Kearney, who erroneously referred it to *Saxifraga Grayana*, a member of the subgenus *Hydactia*. The species really belongs to the subgenus *Micranthes* and is a close relative of the common *Saxifraga Virginensis*. The primary character to debar it from relationship with *S. Grayana* is its subulate filaments; the calyx-segments, petals and follicles are also different from those of that species. The pubescence in *S. Tennesseensis* is inclined to be tomentose and tawny and is much more abundant than in *S. Virginensis*. Besides its general habit, it can be readily distinguished by its lanceolate petals, which are notched at the apex and strongly marked with two yellow spots near the base.

SAXIFRAGA CLAYTONIAEFOLIA Canby n. sp.

Perennial by a short horizontal rootstock, slender, glandular-pilose above, glabrate below. Leaves fleshy, orbicular-elliptic, more or less oblique, 6-10 cm. long, glabrate, obtuse, entire, undulate, palmately six-eight-nerved, narrowed into a winged ribbed petiole which is as long as the blade or longer; scape erect or assurgent, 2-3 dm. tall, glabrate near the base, branched above; inflorescence thyrsoïd-corymbose, its branches subtended by small linear or linear-oblong bracts; flowers white, 4 mm. broad, each subtended by a small bractlet; calyx flattish, 2 mm. high, its segments spreading and recurved, thin, oblong, acute, 3-nerved, longer than the tube; petals spatulate or obovate-spatulate, 2 mm. long, slightly emarginate or minutely apiculate, gradually narrowed into a claw, marked with a stout midnerve which gives off two lateral nerves about the middle; filaments subulate, shorter than the petals, incurved at the summit; follicles (each) ovoid, 3 mm. long, the short stout styles spreading at an angle of 120° or more; seeds irregularly oblong, .7 mm. long, reddish, smooth, or very faintly striate.

Damp crevices of rocks, The Dalles, Oregon. Collected by Frank Tweedy, May, 1883.

I have taken up a specific name attached to a specimen, by Mr. Canby, preserved in the Canby Herbarium, now at the College of Pharmacy, New York. The form is without doubt an excellent species, differing from the related *Saxifraga integrifolia* by its leaves, which closely resemble those of a broad-leaved *Claytonia*, its flat calyx-tube, its oblong calyx-segments and its spatulate or obovate-spatulate petals, which are only 3-nerved and either notched or apiculate at the apex.

SAXIFRAGA NIDIFICA Greene, Erythea, 1: 222. 1893.

This rare *Saxifraga* has lately been sent me by Mr. E. P. Sheldon. The specimens are from Spokane, Washington, altitude 1,000–2,000 feet and were collected by J. H. Sandberg and J. B. Leiberger in May, 1893. *Saxifraga nivalis* (no. 1819) of Mr. Coville's Death Valley report, apparently belongs here, as does also Torrey's 155, collected in the Yosemite Valley and Mountains, California, in 1865.

SAXIFRAGA PLANTAGINEA n. sp.

Perennial by a thick rootstock, stout, scapose, glandular-pilose; leaves elliptic or elliptic-spatulate, 6–10 cm. long, obtuse, undulate or distantly and shallowly toothed, leathery, ciliate, 5–7-ribbed, narrowed into a winged petiole, which is usually much shorter than the blade; scape erect, 2–4 dm. tall, sparingly branched near the top, the branches subtended by elliptic bracts; flowers greenish, in dense cymules; calyx flat, its segments ovate, 3.5 mm. long, obtuse, 3-nerved, longer than the tube; petals suborbicular-oblong or some inclined to be broadly spatulate, 2–2.5 mm. long, greenish, shorter than the calyx-segments, obtuse, marked with a mid-nerve and several branches, narrowed into a broad claw; filaments converging, subulate, shorter than the petals; ovaries immersed in a lobed disk; fruit not seen.

Spokane, Washington, at 600–1,000 meters altitude; collected by J. B. Leiberger and J. H. Sandberg, in May, 1893. Communicated by Mr. E. P. Sheldon.

A fine species with leaves strongly resembling those of some of the broader-leaved *Plantagos*. The plant is very different from anything heretofore known in the genus *Saxifraga*. It is related to *S. integrifolia*. The broad greenish petals, which are exceeded by the calyx, serve to separate the species from all its relatives.

SAXIFRAGA SIERRAE (Coville).

Saxifraga integrifolia Sierra Coville, Proc. Biol. Soc. Wash. 7: 78. 1892.

Saxifraga Oregana Howell, Erythea, 3: 34. 1895.

As Mr. Howell points out, *Saxifraga integrifolia* has been a composite species. Mr. Coville dwells on the differences in the leaves of *Saxifraga Sierra* and *S. integrifolia*; these differences are much more marked in specimens collected later by Mr. Howell,

in Oregon. But in addition to these leaf-characters, the flower furnishes good points of distinction.

The calyx-segments in *Saxifraga Sierrae* are suborbicular and broader than long (except in Mr. Howell's specimens, where the whole vegetative and floral systems are abnormally elongated), the calyx-segments in *S. integrifolia* are ovate and longer than broad; the petals are ovate or broadly oblong and retuse at the apex, as opposed to the obovate petals of *S. integrifolia* with their rounded apices.

SAXIFRAGA REFLEXA Hook. Fl. Bor. Am. 1: 249. pl. 85. 1833.

Several unsuccessful attempts to reestablish this rare species have been made. Taking Hooker's excellent plate as a basis, and this is all we have to go on besides his description, I find that the following numbers from the collections of the Northern Transcontinental Survey, distributed as *Saxifraga nivalis*, are *S. reflexa*: 51a Scribner, 740 and 741 Tweedy, 757 Brandegee and 111 Canby. These are the only representatives of *S. reflexa* I have seen and are all in the Canby herbarium.

SAXIFRAGA MONTANENSIS n. sp.

Scapose, perennial by a stout horizontal or ascending rootstock, coarse, stout, glandular-pilose. Leaves basal, ovate or lanceolate, .5-1.5 cm. long, leathery, obtuse or acute, serrate-dentate, nearly sessile or apparently sessile on account of the broadly winged and dilated petiole; scapes solitary, erect, 3-6 dm. tall, stout (6-11 mm. in diameter), paniculately branched above, the branches usually shorter than the internodes; flowers greenish, almost 11 mm. broad, in dense glomerate cymules; calyx turbinate-campanulate, 5-parted to below the middle, its tube adnate to the ovary, its segments triangular-ovate, obtuse, at length deflexed; petals 5, greenish, lanceolate or linear, often slightly oblique, 3.5 mm. long, obtuse, 3-nerved, the lateral nerves arising below the middle, running close to the mid-nerve; filaments subulate, thrice shorter than the petals; fruit not seen.

Southwestern Montana, in bogs at 1,850 meters elevation. Collected by Mr. Frank Tweedy (No. 58), July, 1888. Also found by Prof. F. D. Kelsey at Millan, Montana. The proposed species stands between *Saxifraga Sierrae* and *S. Pennsylvanica*. It differs from the former in its harsh pubescence which gives it a dull green color and in its comparatively small greenish flowers. From

the latter it may be distinguished by its habit, its more or less turbinate calyx-tube and the calyx-segments, which are triangular-ovate and about as long as the tube. In *Saxifraga Pennsylvanica* the calyx-tube is campanulate, the segments ovate-lanceolate or ovate and twice as long as the tube. The petals of the new species are oblanceolate or nearly linear, while those of its eastern relative are lanceolate or linear-lanceolate.

SAXIFRAGA NOOTKANA Moçin ; Engler, Monog. Sax. 135. 1872.

Saxifraga Stellaris var. *Brunnoniana* Bong. Veg. Sitcha, 140. 1831. Not *S. Brunnoniana* Wall.

Saxifraga leucanthemifolia var. *Brunnoniana* Engler, Monog. Sax. 135. 1872.

Saxifraga Bongardi Presl ; Engler, Monog. Sax. 135. 1872.

This is one of our northwestern forms that has usually been included under *Saxifraga leucanthemifolia* (*S. Michauxii*). It is more closely related however to the old world *S. stellaris*, but is nearer the Alleghenian *S. Michauxii* than any of the several west-American species of the subgenus *Arabidia* that have so persistently been referred to the Alleghanian form.

SAXIFRAGA FERRUGINEA Graham, Edinb. Philos. Journ. : 349. 1829.

This is another *Arabidia* of the Northwest. It is apparently very rare and has usually been referred to a variety of *S. Michauxii* (*S. leucanthemifolia* Michx.) or included in that species. Some of its distinguishing marks are the low stunted stature, the reddish-brown tomentum and the short few-flowered one-sided corymb. The only recent collection appears to be that of Dr. G. M. Dawson, made on the Queen Charlotte Islands in July, 1878.

SAXIFRAGA NUTTALLII.

Saxifraga elegans Nutt.; T. & G. Fl. N. A. 1: 573. 1840. Not Sternb. 1832.

Little was known of this beautiful and most delicate Saxifrage until it was rediscovered in Oregon in 1871 by E. Hall (156). There is a good and ample specimen of Nuttall's type in the Columbia University Herbarium. Mr. Howell has lately found it at three localities in Oregon.